

GEOLOGICAL WORK IN THE UNITED STATES.

THE work of the Geological Survey of the United States is in many regions also geographical. Bulletin No. 307 (1906), by Henry Gannett, is thus a useful "Manual

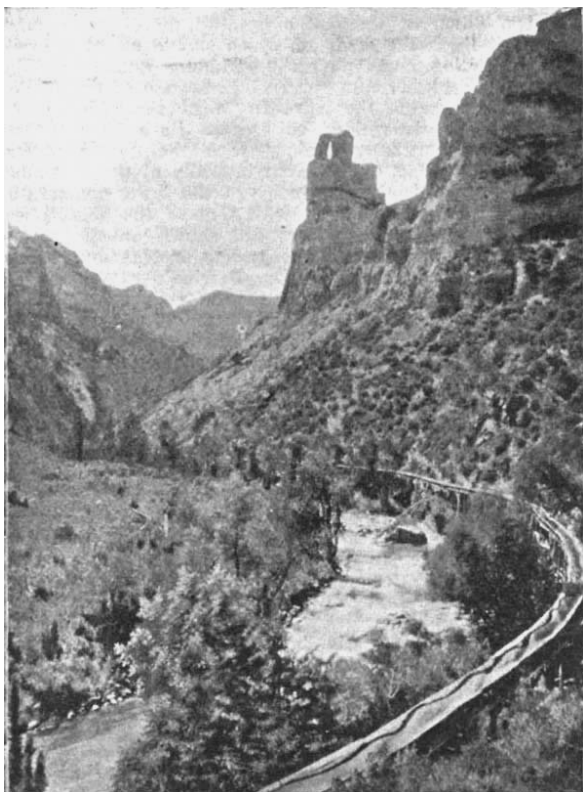


FIG. 1.—Weathering of Madison (Carboniferous) Limestone, Tongue River Canyon, Bighorn Mountains.

of Topographic Methods," reviewing in its eighty-six pages "the most approved methods of surveying as applied to the production of topographic maps." Those of us who have used the American maps on the scale of 1:62,500 may have wondered at the selection of this figure in place of our 1:63,360, or 1 inch to one mile. It is here clear, however, that the American scale is a convenient deduction from 1:250,000, which is employed for the maps of large areas, and which furnishes a scale of practically four miles to an inch. The thick Bulletin No. 299, by Mr. Jas. McCormick, is a second edition of the "Geographic Dictionary of Alaska," and includes 9300 names, as against 6300 published in 1902, numbers that afford "a rough indication of Alaskan growth."

Mr. N. H. Darton's "Geology of the Bighorn Mountains" (Professional Paper No. 51, 1906) is a fascinating description, very handsomely illustrated, of a region in Wyoming that has come into notice as a summer resort. There are few areas more calculated to convert the ordinary man into a keen stratigraphical geologist. Huge sections can be read off on the mountain-sides, and Cambrian, Ordovician, Carboniferous, Triassic, Jurassic, and Cretaceous deposits are represented. The Cretaceous system closes with fresh-water stages some

9000 feet thick, containing coal-seams in the upper layers, which correspond with the type of strata usually known as Laramie. Prof. R. D. Salisbury (pp. 71-90) describes the glacial geology, largely from material gathered by Messrs. Blackwelder and Bastin. Two Glacial epochs are traceable, and diminutive glaciers belonging to the later one still remain in the great chain of pre-Cambrian granite, rising 12,000 feet above the sea (see Plates xxix., xxxvi., &c.). It is claimed that glacial erosion has deepened some of the valleys by at least 700 feet. A glacial and a geological map accompany the memoir, in a pocket at the end, in accordance with the convenient plan now adopted by the United States Survey.

West of the Bighorn Mountains stretches the Bighorn Basin, on an average 5000 feet above the sea. Its geology and water-supply have been described by Mr. C. A. Fisher (Professional Paper No. 53, 1906). The basin is formed by a broad synclinal of the older strata, and its floor is occupied by Laramie beds, unconformably covered by the Eocene Wasatch clays and sandstones, as is well shown in Plate x. The ranges on the west divide this basin from the Yellowstone Park, and hot springs and geyser-deposits occur within the area now described.

Mr. N. H. Darton, the author of the memoir on the Bighorn Mountains, also describes the Arkansas Valley in eastern Colorado (Professional Paper No. 52, 1906). This is a dry region, where artesian water, held up in the Dakota sandstone, is of great economic importance, and the coloured map forming Plate xxvi. shows, by contour-lines, the altitude of the top of the sandstone above sea-level, whether exposed at the surface or concealed. The uplift of the Rocky Mountains in this region followed on the fresh-water Laramie epoch, and the rivers began to form flood-plains, and to carve out the main features of the topography in the western hills, as far back as Eocene times (p. 49). The flat alluvial fan of Miocene age attains in itself a thickness of 1000 feet.

Mr. A. C. Veatch's memoir on northern Louisiana and southern Arkansas (Professional Paper No. 46, 1906) covers a vast region, where the streams pour down from the "wolds" on the Texas and Arkansas border into the great alluvial valley of the Mississippi, which is rich in "ox-bows," on the east. The characteristic Cretaceous, Eocene, and Oligocene fossils are well illustrated, and marine conditions remained in this area until a very gradual tilting up of the north and a lowering of the coast-region set in at the opening of Miocene times (p. 44). The low mounds of fine loam, 20 feet to 100 feet across and 3 feet to 5 feet high, which dot the fluvial plains

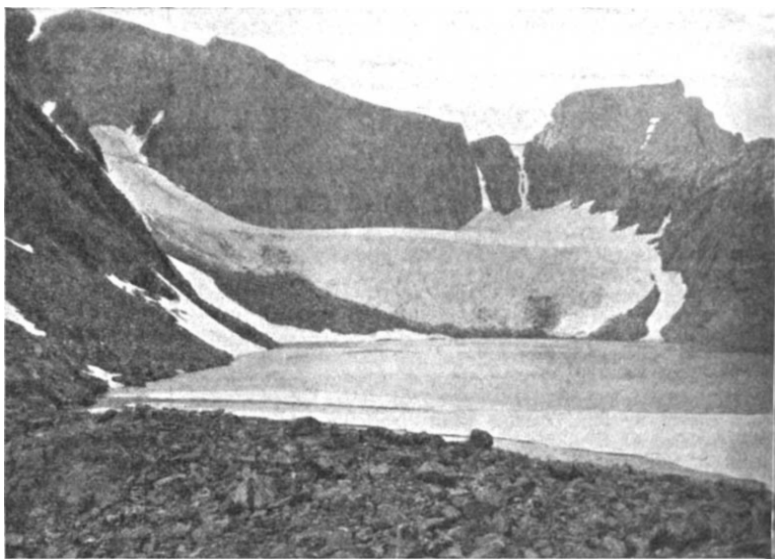


FIG. 2.—Residual Glacier in ci-que, Cloud Peak, Bighorn Mountains.

of the Louisiana and Texas coast, provide a very interesting discussion (p. 53). They are not forming under exist-

ing conditions, and may have been due to ancient wind-action, or even to termite ants, which subsequently passed away in the face of climatic changes. Some 250 pages of the paper are devoted to the underground water-supply of the region, and various methods of well-drilling are described and illustrated.

Bulletin No. 298 contains a record of deep wells drilled during 1905, particulars of which are collected by the Survey, while geological advice is freely given to well-sinkers who ask for it, and the difficulties likely to be encountered are pointed out. Bulletins Nos. 279, 286, 304, 317, and 318 (1906-7) deal with various coal and oil districts. Indications of underground structure are given on the maps, and in No. 318 transparent sheets with contours are supplied, to be laid over the ordinary maps, and indicating the depth at which a particular oil-bearing bed may be encountered. No. 320, by Messrs. S. F. Emmons and Irving (1907), contains important additions to what has been previously published on the ores of Leadville, Colorado; the Downton district serves as the particular instance. Waters originating during the cooling of igneous masses are here put into a prominent place as ore-bearers (p. 66), though at Leadville the concentration of ore "in exceptionally rich bodies has come about through the agency of surface waters" (p. 72). Bulletin No. 297, by Mr. M. R. Campbell (1906), treats of another asset of Colorado, the Yampa coalfield, north-west of Leadville, where the coals are in the Montana stage of the Upper Cretaceous strata. Mountain-building processes have converted much of this "sub-bituminous" coal into coal of a higher grade, while metamorphism by igneous intrusions has given rise in parts to anthracite. Mr. Darton, in the Bighorn memoir mentioned above, describes coals, including a 7-foot seam, still higher in the Cretaceous system to the north of Yampa.

Bulletins No. 303 (S. Nevada, 1907) and No. 295 (Yukon-Tanana, Alaska, 1906) are concerned with gold-mining; the topographical map in the latter is regarded as the most important feature, and similar sheets are being rapidly pushed forward on the 1:250,000 scale.

Petrographers and chemists will be grateful to the Survey for Bulletin No. 305 (1907), by Mr. W. F. Hillebrand, on "The Analysis of Silicate and Carbonate Rocks." This will take the place of the well-known No. 176. Attention is given to the question of porosity (p. 38), which is so important a factor in building-stones, and the rocks composed of carbonates are now for the first time specially considered. Mr. T. N. Dale describes (No. 313, 1907) the "Granites of Maine," the foundation of a very important industry. The striking sheet-structure of granite is discussed (p. 30), and stress is laid on its possible origin by compressive strain. Dark knots in the granite due to segregation are distinguished from the inclusions that also occur (p. 50). Examples of the use of the granite in carved work are shown in the illustrations. Messrs. Emerson and Perry (Bulletin No. 311, 1907) describe the "Green Schists and Associated Granites and Porphyries of Rhode Island." Interesting features of contact-metamorphism occur, including the brecciation of a meta-granite by a later granite magma, and the production of interstitial films of biotite and magnetite between some of the closely adjacent fragments (p. 68). Explosive action at the top of the dome seems to have blended this breccia with a true Carboniferous conglomerate at the surface. A new locality for riebeckite is here given (p. 53).

The only palaeontological bulletin received by us is No. 292 (1906), by Mr. R. S. Bassler, on "The Bryozoan Fauna of the Rochester Shale." This shale is a member

of the Niagaran series (Silurian, *i.e.* Upper Silurian), and is well displayed in the Niagara gorge. The conditions of its deposition seem to have been admirably suited for bryozoan life, and types abound which are not represented conspicuously in contemporary American strata elsewhere. As "compared with the Ordovician types, the noticeable features are the predominance of the Cryptostomata and the decline of the Trepostomata" (p. 2). The author (p. 8) asks English workers to undertake a comparison of the Rochester bryozoa with those which have "received but little study" in the Buildwas beds of the Wenlock series. The thirty-one excellent plates in this bulletin will prove helpful to anyone who will accept this friendly challenge. Even our Carboniferous bryozoa have been much neglected during the last quarter of a century.

Before we pass to the surveys of separate States, we must mention Mr. Weeks's continuation of the "Bibliography and Index of N. American Geology and Mineralogy" (Bulletin No. 301), which covers all work done from 1901-5 inclusive.

The Wisconsin Geological and Natural History Survey sends us three bound Bulletins. No. xv. is on the "Clays of Wisconsin," by Dr. H. Ries (1906), and treats of the characters of clays in general from an economic point of

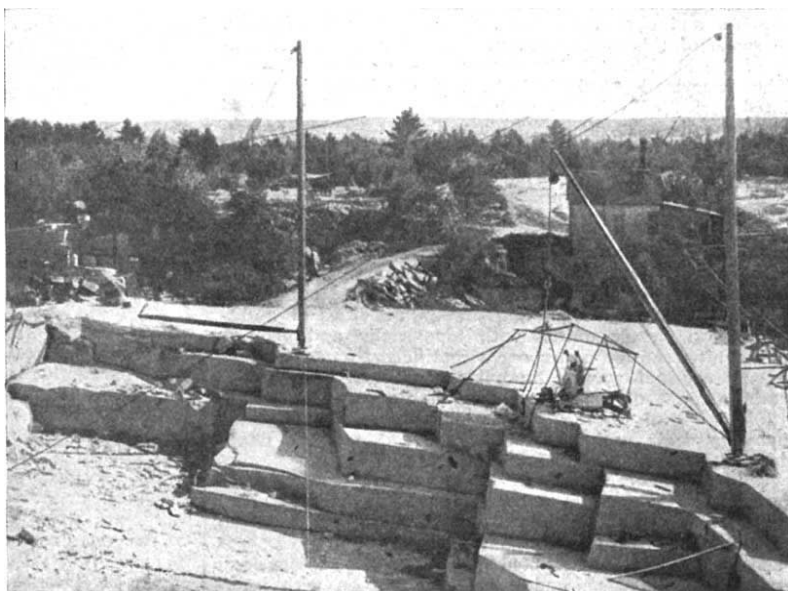


FIG. 3.—Sheet-structure in granite, Sullivan, Maine.

view, as well as giving details of those worked within the State. Tests of clays and bricks have been made for this report. On p. 213, in an appendix on "Molding Sands," we note a formula for determining the pore-space of a sand which would give far too low a result. "Grains" should, we presume, read "grams" in this passage, and we take it that the formula intended is $100(V_d - W)/V_d$, if a percentage is required.

Bulletin No. xvi. is a volume of nearly 700 pages, with folded maps, by Mr. S. Weidman, on the "Geology of North Central Wisconsin" (1907). About 75 per cent. of the area is occupied by intrusive igneous rocks, which are fully described, and which have sometimes been crushed and converted into schists. The troctolites and nepheline-syenites will attract petrographers, and there are interesting intermixtures of granites and diorites (Plates xxii. and xxiii., for example), and gneissose "nepheline-pegmatites," the banding in which is due to original flow. On p. 308 the new variety of pyrochlore, called marignacite, is described. The account of the glacial features of the area is prefaced by a general sketch of North American glaciation, and the full and admirably illustrated chapters on the surface-configuration ought to interest every educated

dweller in the State. References, however, are required throughout this volume from the illustrations to the text. Bulletin No. xvii. is on the "Abandoned Shore-lines of Eastern Wisconsin," by Mr. J. W. Goldthwait (1907), and is a study of the development and passing away of the lakes and lake-extensions associated with later Glacial times. The evidences of warping in the shore-terraces through earth-movement are of special interest. Mr. E. C. Harder has contributed a study of the relations of streams and joint-systems to the Bulletins of the University of Wisconsin (No. 138, 1906), in which the south-western area of the State is dealt with. The maps, however, do not at once carry conviction, owing to the obvious influence of large topographic features on the courses of many of the smaller streams.

The Iowa Geological Survey issued its fourteenth annual report (for 1905) in 1906, a thick volume giving much information on the economic and general geology of the State. The descriptions, fully illustrated, are published county by county, and the stratigraphy concerns Ordovician and Silurian rocks especially. Next in interest to these come the glacial drifts, often overlain by loess of the usual problematic origin. The value of this loess as a soil-provider is justly dwelt on on p. 393. The huge boulders from northern Minnesota and Wisconsin, often of red granite, remind one of those of Holland and north Germany, and similarly serve as quarries for the farmer. The scope of this survey covers forestry and the observation of the local flora.

The Maryland Geological Survey continues its well-printed series of volumes with one on the Pliocene and Pleistocene deposits (1906), one on Calvert County (1907), and one on St. Mary's County (1907). In the county volumes we again note how geological surveys in the United States tend to become natural history surveys, with the view of the application of all branches of observation to local education and the local industries. This is a return, and we venture to think a welcome one, towards the broad and wholesome "statistical surveys" of the eighteenth and early nineteenth centuries; and surely the climate, plant-associations, and human activities of a district are so closely united with topography and geology that a united survey under one scientific department seems the only rational way of studying a political division. A certain amount of repetition, even in diagrams and illustrations, is, of course, inevitable, if each county is separately dealt with, but local knowledge is no doubt enlarged by such a system. The palæontological studies given in the Pliocene volume show that so-called "pure" science is in no danger of being eclipsed. The superficial deposits of Maryland (called "surficial" in the memoir) are "the last of a long series of unconsolidated beds which began to be deposited in Lower Cretaceous and possibly Jurassic time, and have continued on with interruptions down to the present" (p. 136). Five systems of terraces are traced in the coastal plain, the highest being the oldest. These are uplifted terraces of marine deposition, and represent the seaward edges of submarine platforms, successively constructed out of the products of coast-erosion and of materials swept by currents against the shore (p. 108). It is interestingly urged that "the Atlantic seaboard has been repeatedly elevated when loaded and depressed when lightened" (p. 137).

The domes of folding in Maryland, its Upper Devonian fauna, its climate, and the historical origin of its counties are dealt with in the Johns Hopkins University Circular, "Notes from the Geological Laboratory" (July, 1907). The work of the University, the State Survey, and the general United States Geological Survey seem happily combined (p. 2) in the interests of research.

Dr. J. A. Udden publishes in the Bulletin of the University of Texas, No. 93, 1907, an account of the "Geology of the Chisos Country, Texas," which is of the more value since the Geological Survey of that State has been discontinued.

Lastly, workers in Silurian fields will be interested in Mr. E. M. Kindle's paper on the "Occurrence of the Silurian Fauna in Western America" (*Amer. Journ. Sci.*, vol. xxv., February, p. 125). "Silurian" is used in the restricted sense now common in England, and beds of this age are traced in the Wasatch Mountains of Utah

and Alaska. *Conchidium Knightii* is large and abundant on Kuiu Id. in S.E. Alaska, though not hitherto known from the United States. Another old acquaintance, *Pentamerus oblongus*, is abundant in the Utah fauna.

G. A. J. C.

THE ROYAL SANITARY INSTITUTE.

THE annual congress of the Royal Sanitary Institute was held at Cardiff last week. Many interesting papers were read, and several useful discussions were arranged. A large proportion of the papers fittingly dealt with practical and demonstrative matters arising out of the duties and work of sanitary and educational authorities and the officials who serve them. There was a dearth of original contributions of a scientific nature, but those contributions which appear to call for special reference are the following:—

Dr. W. G. Savage read a paper upon "The Examination of Sausages and their Hygienic Preparation." While sausages are usually composed of good meat, finely minced and mixed with flour, spices, and flavouring agents, such as salt, pepper, and sage, there are no definite guiding standards in this country either as to their composition, the presence and amount of preservatives, or their bacterial content. Hitherto there does not appear to have been any investigation dealing with the bacteria of sausages, and Dr. Savage has recently examined twelve different samples, purchased on the open market, in order to see how far typical excretal organisms are present in them. Most of the sausages examined were quite recently made, and the results show that *Bacillus Coli* of definite excretal type were always present in large numbers, whereas the ordinary musculature, bread, and other constituents of sausages in their pure state do not contain *B. Coli*. Although this bacillus is the distinctive organism of excreta, and the fact of its presence in considerable numbers in sausages is not a nice matter to contemplate, it must be realised that the bacillus referred to is found in the intestines and given off from the dejecta of animals generally. These and other facts referred to by Dr. Savage call for the framing of some standard by which the purity and wholesomeness of these articles of food can be judged.

An instructive paper was presented by Mr. H. Percy Boulnois upon "The Utilisation of Residuals from Refuse Destroyers," and two other papers were contributed to the congress upon the same subject. The amount of refuse produced in a town in this country is about a quarter of a ton per head of population per annum, and after this has been cremated in a destructor, the residual clinker represents from 25 to 33 per cent. of the refuse burnt. Of the many methods which have been devised for utilising this material, reference was made to a very recent method which involves the use of the lightning dust crusher for converting furnace clinker into the form of poudrette. The lightning dust crusher consists of a comparatively small steel case containing four or six steel hammers, each weighing about 50 lb. The axle on which these hammers hang is rotated by machinery at the rate of about 1000 revolutions per minute. The machine can be fed at the rate of four tons an hour, and the poudrette escaping finds a market, as a manure, at 2s. 3d. per ton. It is quite inoffensive to the smell, and recently Mr. H. J. Coles, the surveyor of Market Harborough, has, by mixing the poudrette with tarry compounds, made very serviceable fuel briquettes, with a calorific value amounting to one-third that of the best coal.

Mr. Reginald Brown had some experiences to offer with reference to "The Surface Treatment of Roads in Relation to Dust Laying." He recommended the use of oil-tar, which is a by-product of the manufacture of gas from oil, and varies in its composition according to the temperature of production, the nature of the retort or producing plant, and of the oil used. The lack of uniformity in composition, however, does not seriously affect its suitability for road treatment. From extended experience it has been found that four dressings are required for each watering season, and that on an average one gallon will cover ten superficial yards. The cost of "surfacing" a road with oil-tar averages one penny for four dressings (no grit being required for covering), and this works out